



Project Health Genesis



Health IT Track #1: Identity Management and APIs

PRESENTED BY TEAM NUCLEUS HEALTH

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Medical Imaging is common and costly

Medical Imaging procedures are involved in 28.7% of patient encounters

7.7% of images were repeated within 90 days

Connectivity reduced the odds of repeated imaging by 25%

Industry is aggressively transitioning to cloud based image sharing systems

Medical Imaging could be the catalyst to establishing a global network of trust for medical records

[* Am J Manag Care. 2014;20\(11 Spec No. 17\):eSP16-eSP24](#)

Introducing Health Genesis

 Identity management via public key cryptography

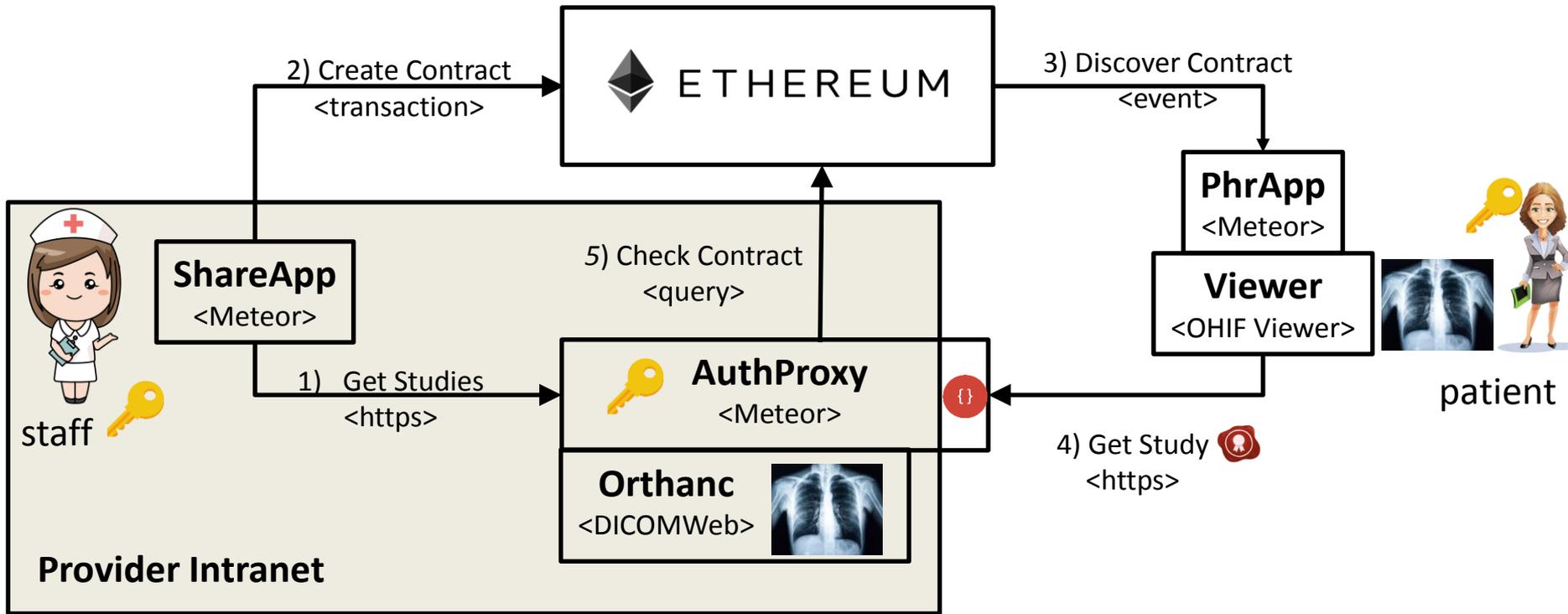
 Authentication via digital signatures

 Authorization via smart contracts

 Bridges RESTful standard API's to blockchain

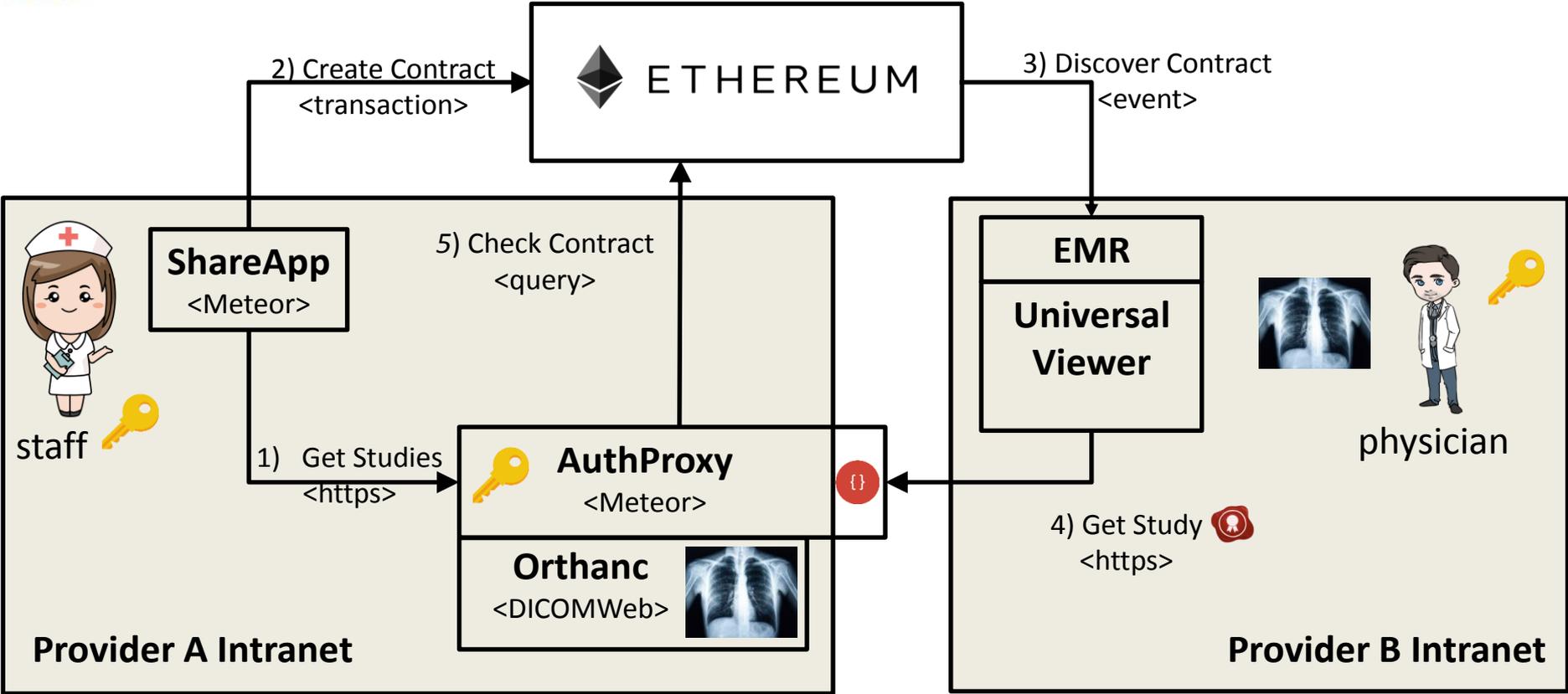
Health Genesis bridges existing Health IT investments into the new world of blockchain, global access and patient controlled data

Use Case: Provider to Patient Sharing



Architecture is generalized for sharing any URL based resource between any users – patients and providers

Use Case: Provider to Provider Sharing



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Demo

Note: All code was written during the 24 hour code-a-thon period and available on
github

We provide a complete Docker-based container deployment

- Health Genesis Applications
- Modified OHIF Viewer
- Private Ethereum Network (10 pre-built identities)
- Orthanc Image Archive
- Mongo Database

Works on Linux or Mac OS X

- Digital Wallets integrate with an application to prove a person's identity
- Currently available solutions:
 - MetaMask (browser extension)
 - uPort (mobile app + APIs)
 - Mist (custom browser)
- Identity is established through proof of private key ownership – wallet signs a message using person's private key, which can be validated by an application using the public key
- Application stores person's blockchain address as user identifier
- Off-chain data is associated with blockchain address using traditional database

Message Signing

```
function signRequest() {
  // prompt user to sign
  var msSinceEpoch = new Date().getTime();
  var ctx = Session.get('ethereumContext');
  var contractAddress1 = ctx.wadoContract;
  var contractAddress2 = ctx.wadoRsContract;

  var message = contractAddress1 + contractAddress2 + msSinceEpoch;
  var msgHex = web3.sha3(message);

  web3.eth.sign(web3.eth.accounts[0], msgHex, function(err, result) {
    if(err) {
      console.log('error signing:', err);
      return;
    }

    var sig = hexSigToRSV(result);

    signedHeaders = {
      "x-secp256k1-r" : sig.r.toString('hex'),
      "x-secp256k1-s" : sig.s.toString('hex'),
      "x-secp256k1-v" : sig.v,
      "x-timestamp" : msSinceEpoch,
      "x-contractaddresses" : contractAddress1 + ',' + contractAddress2,
    }

    Session.set('signedHeaders', signedHeaders);
    userSigned.set(true);
    console.log(result);
  });
}
```


checkTimeStamp()

→ prevents replay attacks

checkOwner()

→ makes sure the smart contract was issued by this resource owner

checkRecipient()

→ makes sure the caller is who they say they are

→ make sure the caller is the recipient in the smart contract

checkUrl()

→ make sure the URL matches what is in the smart contract

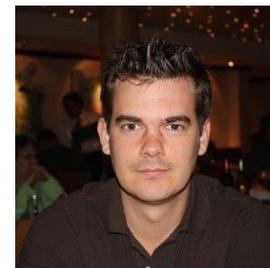
Thank You!



Durand Van Arnem



Matt Brinkman



Jason Klotzer



Chris Hafey



Jason Nye

Health Genesis!

Please [Register](#) or [Login](#)

Health Genesis ShareApp

Medical Record Search

Please

enter the registration code provided by your doctor (use "topsecret")

[Register](#)

or

[Login](#)

Staff authentication using digital signature

The image shows a web application interface for staff authentication. The background features the text "Health" and "areApp" in large, bold, black font. Below this, the text "Medical R" is visible. A registration form is present with the text "Please enter the registration code" and a text input field containing "topsecret". A blue "Login" button is located below the input field. Overlaid on the center of the screen is a "MetaMask Notification" window. The notification window has a title bar with three colored circles (red, yellow, green) and the text "MetaMask Notification". The main content of the notification is titled "CONFIRM TRANSACTION" and "Sign Message". It contains a red warning message: "Signing this message can have dangerous side effects. Only sign messages from sites you fully trust with your entire account. This will be fixed in a future version." Below the warning is a circular profile picture of a person with a pink and blue background. To the right of the profile picture, the text "Chris H..." is displayed. Below the profile picture, the text "ADDRESS" and "BALANCE" are shown, with the values "0x9332827e...0C31" and "None" respectively. At the bottom of the notification window, there are two orange buttons: "Cancel" and "Sign".

Health areApp

Medical R

Please enter the registration code

topsecret

or Login

MetaMask Notification

CONFIRM TRANSACTION Private Network

Sign Message

Signing this message can have dangerous side effects. Only sign messages from sites you fully trust with your entire account. This will be fixed in a future version.

Chris H...

ADDRESS 0x9332827e...0C31

BALANCE None

MESSAGE0x4a29bc329589b6ea0e2024e81bd7d42a99b4

Cancel Sign

Health Genesis ShareApp

Hello, 0x5cab4cb92c4266ff535fe8da18092b0545c70ae3

Log Out

Medical Record Search

QIDO URL:

Patient Name

TCGA-4Z-AA7M

Search

Patient Name

Patient ID

Study UID

TCGA-4Z-AA7M

TCGA-4Z-AA7M

1.3.6.1.4.1.14519.5.2.1.6354.4016.325142651224193401620709391720

Share

Staff share to patient/provider identity

Health Ge

Hello, 0x5cab4cb92c4266ff535fe8da18092

Share Exam

Recipient Address

[Share](#) [Close](#)

[Log Out](#)

Medical Record Search

QIDO URL:

[Search](#)

Patient Name	Patient ID	Study UID	Share
TCGA-4Z-AA7M	TCGA-4Z-AA7M	1.3.6.1.4.1.14519.5.2.1.6354.4016.325142651224193401620709391720	

Health Genesis PHR

Please [Register](#) or [Login](#)

Patient authenticate via digital signature

MetaMask Notification

CONFIRM TRANSACTION Private Network

1 of 3 →
Sign Message

Signing this message can have dangerous side effects. Only sign messages from sites you fully trust with your entire account. This will be fixed in a future version.

Account... ADDRESS 0x5cab4Cb9...0AE3
BALANCE None

MESSAGE0x9d10cd48598cf3c3d99f9b678d961ba4c2a8b

Cancel Sign

Please [Register](#)

Heal HR

Health Genesis PHR

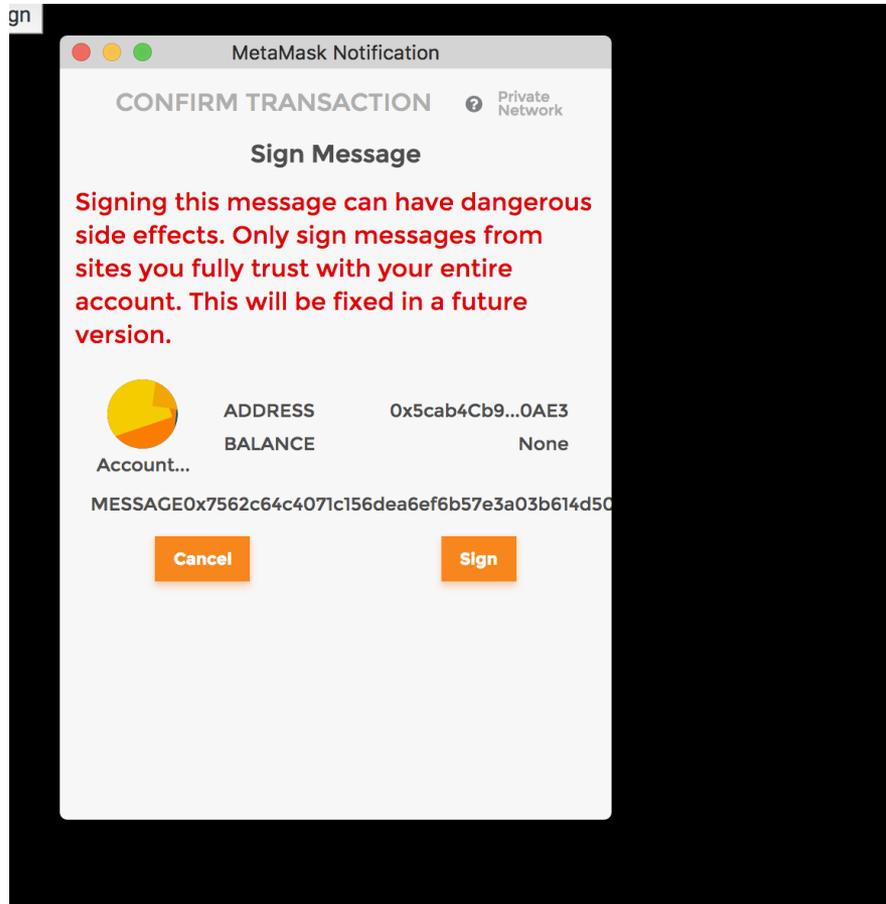
Hello, 0x5cab4cb92c4266ff535fe8da18092b0545c70ae3

Log Out

Timestamp	Block#	StudyUID
Wed Mar 15 2017 01:08:43 GMT-0400 (EDT)	29	1.3.6.1.4.1.14519.5.2.1.6354.4016.325142651224193401620709391720

View Images

Patient authenticates using digital signature



Patient accesses images

